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09/206,027	12/04/98	COHEN	<sup>mk</sup> AMAT/3049/MD

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EXAMINER

VINH, L

ART UNIT

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15

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

**Commissioner of Patents and Trademarks**

# Office Action Summary

Application No.  
09/206,027

Applicant(s)  
Cohen et al.

Examiner  
Lan Vinh

Art Unit  
1765



-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

1) ☒ Responsive to communication(s) filed on 5/18/01

2a) ☒ This action is FINAL. 2b) ☐ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1035 C.D. 11; 453 O.G. 213.

## Disposition of Claims

4) ☒ Claim(s) 1, 3-8, and 10-30 is/are pending in the application.

4a) Of the above, claim(s) \_\_\_\_\_ is/are withdrawn from consideration.

5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.

6) ☒ Claim(s) 1, 3-8, and 10-30 is/are rejected.

7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.

8) ☐ Claims \_\_\_\_\_ are subject to restriction and/or election requirements.

## Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are objected to by the Examiner.

11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved.

12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. § 119

13) ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

a) ☐ All b) ☐ Some\* c) ☐ None of:

1. ☐ Certified copies of the priority documents have been received.

2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.

3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\*See the attached detailed Office action for a list of the certified copies not received.

14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

## Attachment(s)

15) ☒ Notice of References Cited (PTO-892)

18) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_

16) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

19) ☐ Notice of Informal Patent Application (PTO-152)

17) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s). \_\_\_\_\_

20) ☐ Other: \_\_\_\_\_

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## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1, 5, 6, 7 are rejected under 35 U.S.C 103(a) as being unpatentable over Konecni et al. ( EP 0849 779 A2).

Konecni discloses a process for forming a semiconductor structure using plasma etching comprising exposing a patterned substrate surface to a plasma generated by gases of argon, helium, hydrogen in a processing chamber ( col 3, lines 52-57 and col 6, lines 40-47 and fig. 4 ). That reads on exposing a patterned substrate surface to a plasma generated from a gas mixture of argon, helium, hydrogen in a processing chamber.

Unlike the instant claimed invention as per claim 1, Konecni does not disclose the specific percent by volume ( etchant concentration/flow rate ) of argon in the gas mixture although Konecni discloses that his method contemplates any suitable flow rates of the gases ( col 4, lines 1-2 )

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However, in a method of plasma etching , it is well known that etching parameters such as etchant concentration, temperature, and flow rate affect both the rate and quality of the plasma etching process.

Therefore, it is the examiner's position that since Konecni discloses that any suitable flow rates of the gases can be used, it would have been obvious to adjust Konecni's argon concentration/flow rate by optimizing the same by conducting routine experimentation for the purpose of obtaining the best result.

Regarding claim 5, Konecni discloses that the substrate surface comprises silicon oxide ( col 5, lines 24-26 )

Regarding claims 6, Konecni discloses that the plasma is capacitively and inductively powered by bias power ( col 3, lines 42-44 ).

Regarding claims 7, Konecni discloses introducing argon, helium, hydrogen into the processing chamber to establish a low or vacuum pressure (  $10^{-7}$  Torr to  $10^{-8}$  Torr ) ( col 4, lines 34-35; col 6, lines 30-45 ).

3. Claim 3 is rejected under 35 U.S.C 103(a) as being unpatentable over Konecni et al. ( EP 0849 779 A2).

Konecni discloses a process for forming a semiconductor structure using plasma etching comprising exposing a patterned substrate surface to a plasma generated by gases of argon, helium, hydrogen in a processing chamber ( col 3, lines 52-57 and col 6, lines 40-47 and fig. 4 ).

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That reads on exposing a patterned substrate surface to a plasma generated from a gas mixture of argon, helium, hydrogen in a processing chamber.

Unlike the instant claimed invention as per claim 3, Konecni does not disclose the specific percent by volume ( etchant concentration/flow rate ) of helium and hydrogen in the gas mixture although Konecni discloses that his method contemplates any suitable flow rates of the gases ( col 4, lines 1-2 )

However, in a method of plasma etching , it is well known that etching parameters such as etchant concentration, temperature, and flow rate affect both the rate and quality of the plasma etching process.

Therefore, it is the examiner's position that it would have been obvious to adjust Konecni's helium and hydrogen concentration/flow rate- by optimizing the same by conducting routine experimentation for the purpose of obtaining the best result.

4. Claim 4 is rejected under 35 U.S.C 103(a) as being unpatentable over Konecni et al. ( EP 0849 779 A2) in view of Jen ( US 5,773,367).

Konecni has been described above in paragraph 2. Unlike the instant claimed invention as per claim 4, Konecni does not specifically disclose the step of increasing the helium content of the plasma to increase etching of the patterned substrate surface.

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However, Jen discloses a method to plasma etching an oxide layer comprises the step of increasing the helium flow rate ( content ) to increase the etch rate of the patterned oxide surface ( col 6, lines 4-9 and Fig. 7A).

Therefore, one skilled in the art would have found it obvious to modify Konecni's process by adding the step of increasing the flow rate ( content ) of helium to increase the etch rate of the patterned oxide surface as per Jen because Konecni states that bombardment of a material with inert ion ( helium ) increases the reactive surface area of the material accessible to reactive (etching) hydrogen ions ( col 7, lines 5-8 ).

5. Claims 8, 10-23 are rejected under 35 U.S.C 103(a) as being unpatentable over Konecni et al. ( EP 0849 779 A2) in view of Jen ( US 5,773,367).

Konecni discloses a process for forming a semiconductor structure using plasma etching comprising exposing a patterned substrate surface to a plasma generated by gases of argon, helium, hydrogen in a processing chamber ( col 3, lines 52-57 and col 6, lines 40-47 and fig. 4 ). That reads on exposing a patterned substrate surface to a plasma generated from a gas mixture of argon, helium, hydrogen in a processing chamber.

Unlike the instant claimed invention as per claims 8, 14, Konecni does not disclose the specific percent by volume ( etchant concentration/flow rate ) of argon in the gas mixture although Konecni discloses that his method contemplates any suitable flow rates of the gases ( col 4, lines 1-2 )

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However, in a method of plasma etching , it is well known that etching parameters such as etchant concentration, temperature, and flow rate affect both the rate and quality of the plasma etching process.

Therefore, it is the examiner's position that since Konecni discloses that any suitable flow rates of the gases can be used, it would have been obvious to adjust Konecni's argon concentration/flow rate by optimizing the same by conducting routine experimentation for the purpose of obtaining the best result.

Jen discloses a method to plasma etching an oxide layer comprises the step of increasing the helium flow rate ( content ) to increase the etch rate of the patterned oxide surface ( col 6, lines 4-9 and Fig. 7A).

Therefore, one skilled in the art would have found it obvious to modify Konecni's process by adding the step of increasing the flow rate ( content ) of helium to increase the etch rate of the patterned oxide surface as per Jen because Konecni states that bombardment of a material with inert ion ( helium ) increases the reactive surface area of the material accessible to reactive (etching) hydrogen ions ( col 7, lines 5-8 ).

Regarding claims 11, 16, Konecni discloses that the substrate surface comprises silicon oxide ( col 5, lines 24-26 )

Regarding claims 12, 14, Konecni discloses that the plasma is capacitively and inductively powered by bias power ( col 3, lines 42-44 ).

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Regarding claims 13, 17, Konecni discloses introducing argon, helium, hydrogen into the processing chamber to establish a low or vacuum pressure (  $10^{-7}$  Torr to  $10^{-8}$  Torr ) ( col 4, lines 34-35; col 6, lines 30-45 ).

Regarding claims 21-23, Konecni discloses generating the plasma by delivering power level of between 150-450 W to the processing chamber ( col 3, lines 40-43 ).

6. Claims 24, 25, 27-30 are rejected under 35 U.S.C 103(a) as being unpatentable over Konecni et al. ( EP 0849 779 A2).

Konecni discloses a process for forming a semiconductor structure using plasma etching comprising exposing a patterned substrate surface to a plasma generated by gases of argon, helium, hydrogen in a processing chamber ( col 3, lines 52-57 and col 6, lines 40-47 and fig. 4 ). That reads on exposing a patterned substrate surface to a plasma generated from a gas mixture of argon, helium, hydrogen in a processing chamber.

Unlike the instant claimed invention as per claim 24, Konecni does not disclose the specific percent by volume ( etchant concentration ) of argon, helium and hydrogen in the gas mixture.

However, in a method of plasma etching , it is well known that etching parameters such as etchant concentration, temperature, and flow rate affect both the rate and quality of the plasma etching process.

Therefore, it is the examiner's position that since Konecni discloses that any suitable flow rates of the gases can be used, it would have been obvious to adjust Konecni's gas flow rates by



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optimizing the same by conducting routine experimentation for the purpose of obtaining the best result.

Regarding claim 27, Konecni discloses that the substrate surface comprises silicon oxide ( col 5, lines 24-26 )

Regarding claim 25, Konecni discloses that the plasma is capacitively and inductively powered by bias power ( col 3, lines 42-44 ).

Regarding claim 28, Konecni discloses introducing argon, helium, hydrogen into the processing chamber to establish a low or vacuum pressure (  $10^{-7}$  Torr to  $10^{-8}$  Torr ) ( col 4, lines 34-35; col 6, lines 30-45 ).

Regarding claim 30, Konecni discloses generating the plasma by delivering power level of between 150-450 W to the processing chamber ( col 3, lines 40-43 ).

### ***Response to Arguments***

7. Applicant's arguments filed on 5/18/2001 have been fully considered but they are not persuasive.

In traversing the examiner rejection, the applicants argue that the teaching or suggestion to make the claimed invention is not found in the Konecni reference. This argument is not found persuasive because Konecni discloses exposing the patterned substrate to a plasma generated by a gas mixture consisting of the same gases ( argon, helium, hydrogen ) as the claimed method, the examiner recognizes that although Konecni does not disclose the specific volume (less than about

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75%)/flow rate of argon in the gas mixture, Konecni teaches that his plasma etching method contemplates any suitable flow rate for these ion/gases ( col 4., lines 1-2 ). The passage of “contemplates any suitable flow rate for these ion/gases”, as interpreted by the examiner, suggests that Konecni’s argon flow rates can be adjusted to any specific range including the ones claimed in the instant invention. The examiner asserts that there is a suggestion in the prior art to make the claimed invention.

It is argued that the Jen reference does not teach increasing the helium content of a plasma to increase etching of the patterned substrate surface. The examiner disagrees because as depicted in fig. 7A of Jen, an increase in oxide etch rate ( patterned substrate surface) as the flow rate of helium increase from 100-120 sccm.

8. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).


A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

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however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

*Conclusion*

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lan Vinh whose telephone number is (703) 305-6302. If attempts to reach the examiner are unsuccessful, the examiner's supervisor, Benjamin Utech, can be reached on (703 ) 308-3836. The official fax number for the organization is (703) 305-3599.

  
ROBERT KUNEMUND  
PRIMARY EXAMINER

LV

May 31, 2001